Jonas II. Claims 48-51 stand rejected under the same as being unpatentable over Liu in view of Cao and Jonas II in further view of U.S. Patent No. 5,667,572 to Taniguchi et al. (hereinafter "Taniguchi"). Claim 54 stands rejected under the same as being unpatentable over Liu in view of Cao and Jonas II in further view of Jonas I.

By this amendment, claims 37, 56, 62 and 63 have been amended to further define the subject matter Applicants regard as the invention. Claims 38-54 and 58 remain unchanged. Thus, claims 37-54, 56, 58, 62 and 63 are presently pending in this application for consideration.

Applicants respectfully submit that claims 37-54, 56, 58, 62 and 63 are patentably distinct over the cited references as required by § 103. Applicants respectfully submit that none of the cited references, whether considered alone or in combination discloses: (1) "independently filling each opening with a composition" as recited in independent claims 37, 56, 62 and 63 and (2) "forming a pattern formation of a hole injecting and transporting layer" as recited in each of the independent claims. Thus, these claims are allowable over the cited references. These distinctions will be further described in the following section.

THE CLAIMS DISTINGUISH OVER THE CITED REFERENCES

The present invention relates to compositions for a hole injecting and transporting layer having suitable physical properties (such as viscosity and surface tension) that make them advantageous for use with an ink-jet recording head to form EL devices. It also relates to a method of forming EL devices with an ink-jet recording head using such compositions.

As such, claim 58 is directed to a composition used for forming a pattern formation of a hole injecting and transporting layer of an organic EL element using an ink-jet recording head. The composition comprises at least a material for a hole injecting and transporting layer and a polar solvent as a solvent with the composition having a viscosity between 1 to 20 cps and a surface tension of 20 to 70 dyne/cm. As explained in the specification, the viscosity and surface tension properties are important for its intended use with the ink-jet printing apparatus. Appropriate selection of these physical properties prolongs the flushing time for the ink-jet printing apparatus, produces more uniform dot density, and enhances the linearity of flight and facilitates control of the ink jet apparatus.

The Jonas I and II references describe a composition for a conductive coating that contains polythiophene and water as a solvent. The references also provide a list of techniques for deposition the coating such as spraying, application by a doctor blade, dipping, application with roller application systems, etc. As an initial matter, the references fail to teach or suggest the claimed physical properties of the composition such as the viscosity or surface tension. The Office Action acknowledges these deficiencies in each of the references but alleges by taking Official Notice that factors such as the flowability of ink and its wetting ability on a surface are "well known parameters in coating processes." However, the Office Action fails to cite any disclosure in the references or any other reference that provides a factual basis for the allegation of well known. Thus, the Office Action set forth a conclusion of obviousness, not a reason supporting the alleged obviousness of the claimed invention.

The PTO has the burden under 35 U.S.C. § 103(a) to establish a prima facie case of obviousness. See In re Piasecki, 745 F.2d 1468, 1471-72 223 USPQ 785, 787-88 (Fed. Cir. 1984). It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. See In re Fine, 837 F.2d 1071, 1074 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). This it has not done. The Office Action fails to cite prior art that remedies the deficiencies of the Jonas references or suggests the obviousness of modifying the references to achieve the claimed invention.

Instead, the Office Action improperly relies upon hindsight reconstruction of the claimed invention in reaching its obviousness determination. "To imbue one of ordinary skill in the art will knowledge of the invention, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." See W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 153 220 USPQ 303 312-13 (Fed. Cir. 1983). In addition, according to 37 C.F.R. § 1.104(d)(2), Applicants request the Examiner to provide either a reference or an affidavit in support of his position.

For all of the above reasons, claim 58 is allowable. Applicants respectfully request reconsideration and withdrawal of the rejection of claim 58.

In addition, Applicants respectfully submit that the Jonas references fail to disclose forming a pattern formation of a hole injecting and transporting layer. The Examiner asserts that the Jonas I reference provides a list of techniques for deposition the coatings and the list is not exhaustive. In other words, the Examiner implies that the Jonas I reference does not necessarily exclude ink jet printing methods for forming a film. According to the present invention, however, the ink-jet recording method enables the films and patterns to be formed by selectively providing specific liquid material with a predetermined region. Furthermore, according to the present invention, in a specific manner that a region defined by the partitioning member is filled with material by means of the ink-jet recording method, a fine patterning is accomplished by providing the above region with the composition including the hole injecting and transporting material and a solvent. Thus, the use of the partitioning material enables the material to be securely isolated (See page 23, lines 3-6 of the present specification). The Jonas references fail to describe a method using and in ink-jet recording head for forming a hole injecting and transporting layer. Since the references fail to disclose at least one of the recited features, these references cannot be said to render obvious the subject matter of claim 58. Thus, claim 58 is allowable.

Independent claim 37 is directed to a method of manufacturing an organic EL element having a stacked structure including a hole injecting and transporting layer and a light-emitting layer formed within a partitioning member which is divided into individual pixel areas. The method includes forming the partitioning member on the substrate, filling the openings of the partition members with a composition for the hole injecting and transporting layer using an ink-jet recording head, and drying the composition to form the hole injecting and transporting layer. The composition contains a conductive material containing at least polyethylenedioxythiophene and polystyrene sulfonic acid, and a solvent. Independent method claims 56, 62 and 63 recite similar steps.

In rejecting these claims, the Examiner relied on the combination of Liu, Cao, and Jonas II. Applicants respectfully submit that it would not have been obvious to combine the three references; and even if they are combined, one would not have arrived at the claimed method.

Liu describes a method of forming a luminescent device such as a CRT or flat panel display which has a black matrix separating the pixels. The method includes

forming the black matrix 2, which is in the form of protrusions formed on the substrate, depositing (by sputtering) a layer of ITO over the entire surface including the black matrix and pixel areas, and removing the ITO layer from the top surface of the black matrix to form electric contacts in the pixels (col. 2, line 66 to col. 3 line 16). This deposition is not carried out in a manner that each opening is independently filled with the conductive material. In addition, this conductive material such as indium tin oxide is not a hole injecting and transporting material. Colored phosphors are then deposited in the pixel areas in an electrophoresis process using the ITO as electrodes. However, this deposition is also not carried out in the manner that each opening is independently filled with the material which is the hole injecting and transporting material. Furthermore, it can be seen that in the Liu method, the black matrix is not used as separations for liquids; in other words, liquid is not filled in the openings formed by the black matrix. The ITO layer is sputtered on the entire surface including the top of the black matrix. Liu does not describe the use of an ink-jet printing apparatus.

As stated above, Liu's method is not for forming and organic EL device and he does not teach a composition PEDT and PSS in a solvent as the hole injecting and transporting layer. Cao is relied on for teaching that the anode of an EL device can be an inorganic material (including ITO) or an organic material (including polythiophene) (col. 10). While the Applicants acknowledge that such organic material was known, the present invention focuses on the method (ink-jet method) for forming the hole injection and transport layer and compositions that are suitable for the method. While Cao lists the materials useful for the anode layer, Cao does not teach or suggest the methods for forming the anode, or which method would be suitable for which material. Liu uses sputtering to deposit the ITO, which would not be a suitable method for polythiophene. Thus, neither Liu nor Cao teaches or suggests how the two methods could be combined. Further, neither Liu nor Cao teaches or suggests using an ink-jet printing apparatus.

Jonas II describes a conductive coating composition containing polythiophene and PSS in a solvent such as water. Jonas II states that the coating can be produced "by spraying, application by a doctor blade, dipping, application with roller applicator system, by printing processes such as gravure printing, silk screen printing, curtain casting." Based on this statement, the Examiner asserted that "although ink-jet printing is not explicitly disclosed, ink-jet printing is a notoriously well-known printing method.

Therefore, it would have been obvious. . . to have used ink-jet printing to have deposited the polythiophene film in the EL device suggested by '407 and '281 with a reasonable expectation of success."

Applicants respectfully disagree with the Examiner's conclusion of obviousness. The Examiner appears to assume the all printing methods are interchangeable and can be applied to the Liu process to form the electrode. Applicants strongly disagree. Different printing methods are significantly different in terms of principle, process, and applicability to different types of media. For example, photoelectric printing would probably not be applicable to a process like Liu's Gravure printing and silk screen printing mentioned in Jonas II would also seem to be incompatible with the Liu process. In Liu, the electrode layer is formed after the black matrix is formed, and the protrusions would seem to interfere with the gravure or silk screen printing process. Ink-jet printing method is indeed suitable for a process involving preformed partitions, but this is precisely what is disclosed in the present invention and is found nowhere in the prior art. If the use of ink-jet printing appears "obvious", it is based on nothing other than knowledge and hindsight gleaned from the present invention itself. Absent some teaching or suggestion in the prior art, a case of obviousness cannot be made. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347 21 USPQ2d 1941 (Fed. Cir. 1992). Therefore, Applicants submit that claims 37, 56, 62 and 63 are allowable over the cited references.

With respect to claims dependent from allowable claims 37, 56, 62 and 63, these claims are allowable by virtue of their dependence from the above-mentioned allowable independent claims and for containing other patentable features. Further remarks regarding the asserted relationship between any of the claims and the cited references is not necessary in view of their allowability. Applicants' silence as to the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

CONCLUSION

In view of the foregoing remarks, the Applicants respectfully submit that this application is in condition for allowance and requests early notice to that effect.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Washington, D.C. telephone number 202 637-3615 to discuss the steps necessary for placing the application in condition for allowance.

Respectfully submitted,

HOGAN & HARTSON, L.L.P

Date: 11/27/01

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Version with markings to show changes made:

IN THE CLAIMS:

Please amend the claims as follows:

37. (Once Amended) A manufacturing process for an organic EL element having a stacked structure including a hole injecting and transporting layer and a light-emitting layer formed within a partitioning member which is divided into individual pixel areas, the method comprising:

forming the partitioning member on a substrate, the partitioning member having openings corresponding to pixel areas;

independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet recording head, the composition comprising (1) a conductive material containing at least polyethylenedioxithiophene and polystyrene sulfonic acid, and (2) a solvent; and

drying the composition filled in the openings to form the hole injecting and transporting layer.

56. (Once Amended) A manufacturing process for an organic EL element having a stacked structure including a hole injecting and transporting layer and a light-emitting layer formed within a partitioning member which is divided into individual pixel areas, the method comprising:

forming the partitioning member on a substrate, the partitioning member having openings corresponding to pixel areas;

independently filling each of the openings with a composition for the hole injecting and transporting layer using an ink-jet recording head, the composition comprising at least a material for a hole injecting and transporting layer and a polar solvent; and

drying the composition filled in the openings to form the hole injecting and transporting layer.

62. (Once Amended) A method for manufacturing an electroluminescent display, the method comprising:

(1) manufacturing an EL element, wherein the step of manufacturing the EL element comprises:

forming a partitioning member on a substrate, the partitioning member having openings corresponding to pixel areas;

independently filling each of the openings with a composition for a hole injecting and transporting layer using an ink-jet recording head, the composition comprising (a) a conductive material containing at least polyethylenedioxithiophene and polystyrene sulfonic acid, and (b) a solvent; and

drying the composition filled in the openings to form the hole injecting and transporting layer; and

(2) incorporating the manufactured EL element into the electroluminescent display.

63. (Once Amended) A method for manufacturing an electroluminescent display, the method comprising:

(1) manufacturing an EL element, wherein the step of manufacturing the EL element comprises:

forming a partitioning member on a substrate, the partitioning member having openings corresponding to pixel areas;

independently filling each of the openings with a composition for a hole injecting and transporting layer using an ink-jet recording head, the composition comprising at least a material for the hole injecting and transporting layer and a polar solvent; and

drying the composition filled in the openings to form the hole injecting and transporting layer; and

(2) incorporating the manufactured El element into the electroluminescent display.